Clinical infection services—the UK perspective

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BRIEF STRUCTURE OF MEDICAL CARE IN THE UK

Primary healthcare

All persons in the UK have to be registered with a general practitioner (GP). Every GP has a patient list which varies in size but is in the order of 2000 patients, and most work in group practices which in the past have provided weekend and out-of-hours cover for the population they serve. More recently, cover has been provided by 'GP Co-operatives', who provide an emergency consultation service which includes the facility for domiciliary visits according to the severity of illness. Most out-of-hours general practice cover is now through this means.

Secondary healthcare

Patients who require further investigation or management are referred by the GP to the District General Hospital (DGH). These are locality-based hospitals serving a population of 250 000–350 000, and supported by general internal medicine physicians with special interests in the 'core' specialities, including respiratory medicine, cardiology, gastroenterology, diabetes and endocrinology and care of the elderly. The trend is to move towards appointing at least two consultants in each discipline in most DGHs. There are varying degrees of subspecialization which may result in some 'triage' taking place at the point of referral or at the point of entering the hospital. Many patients now spend the first 24 h of hospital care in an emergency admissions unit, where resources for initial investigation and management are focused. The patient is subsequently transferred to another ward following the 'post-take' ward round. This transfer may be to a specialist unit or to a general unit, depending on the individual hospital.

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Tertiary healthcare

Larger conurbations have hospital systems serving populations of 450 000–500 000 or above, and it is within these settings that most of the regionally based specialist departments, e.g. infectious diseases and tropical medicine, oncology and neurology, are based. These hospitals, which may also be teaching hospitals, as many of the larger cities have medical schools, act as the DGH for the local community but also provide a tertiary healthcare role for delivery of clinical care to more complex or specific or specialist needs.

A recent British consultation document from representatives of the British Medical Association, the Royal College of Physicians of London and the Royal College of Surgeons of England [1] has recommended a structure for hospital healthcare which includes a minimum of two physicians in each of the mainstream disciplines in a DGH. In addition to the core medical specialities, it is recognized that specialities (including infectious diseases) may be present with sufficient consultants and supporting teams to provide a sustainable service. In reality, there are only a few DGHs with physicians trained in infectious diseases in the UK today. The document also states that the larger hospitals (serving about 500 000 people) should have at least three physicians in infectious diseases to provide for inpatient and outpatient infection in hospital and the community. Many cities in the UK do not have this level of input; indeed, the majority still have no infectious disease-trained physicians. All NHS hospitals are supported by microbiology services, and the microbiologists are usually, though not always, on site.

MEDICAL MANPOWER

The current poor status of specialist manpower in the area of infectious diseases in the UK underlines the need for implementation of guidelines such as these. The number of physicians with training in infectious diseases in the UK is about 105, most situated in regional or subregional infectious disease units or in academic centers. The number of microbiologists in the UK is about 490, and of these about 15% are single-handed.

It is clear, therefore, that in the UK there is no uniform formula on which the infection-based specialities and clinical infection services are based.

MANAGEMENT OF INFECTION

Infection in the community

The majority of infection occurs in the community and is managed entirely by GPs with varying degrees of expertise. It is therefore essential that, when considering any infection-based discipline, training and re-training must be high on the list of requirements.

Infection in hospital—the size of the problem

Infection is one of the commonest reasons for admission of patients to hospital. There have been two national prevalence surveys of infection in hospital, the first in the UK and the second in the UK and the Republic of Ireland. The first was performed in 1980 on 18 163 patients; the second, performed in 1993/94 in 157 hospitals on 37 111 patients, showed that infections of the urinary tract (23.2%), surgical wounds (10.7%), lower respiratory tract (22.9%) and skin (9.6%) accounted for 66.5% of the total infections identified [2]. The second study was carried out in 2-month periods between May 1993 and July 1994 to allow for any seasonal variations in the pattern of hospital admissions and case mix. Although the prevalence of hospital-acquired infection had shown no significant change between the first and the second national prevalence surveys (9.2% of patients surveyed in 1980 and 9.0% in 1994), the prevalence of community-acquired infection had increased from 9.9% in 1980 to 14.7% in 1994 (B. Bannister, personal communication). The prevalence was similar in DGHs and teaching/university hospitals, with the highest prevalence being in acute chest units (44.4%), pediatrics (31.7%) and dermatology (24.6%). The overall figure quoted for general medicine was 22.0%. In the survey, there was, not surprisingly, no specific analysis of infectious diseases unit admissions, where the majority would be expected to have an infection diagnosis at discharge.

CLINICAL INFECTION SERVICE

The delivery of a clinical infection service is complex and will vary according to the local availability and the expertise of medical manpower in the infection specialities. These include infectious diseases specialists, microbiologists (bacteriology and virology), public health physicians and epidemiologists. Pediatricians and specialists in clinical immunology and in genitourinary medicine, who also provide varying degrees of input to infection services, will not be considered in more detail in this paper. These are supported by non-medically trained personnel who are extremely important in delivery of service, e.g. infection control nurses, pharmacists and epidemiologists.

Model 1

This represents the optimum infectious diseases service (Table 1) but exists in only a small number of centers in the UK. In order to encompass all aspects of infection in hospitals and the community (including control of infection), a 'multidisciplinary team' approach is needed with input from specialists in all the infection disciplines, i.e. clinicians trained in infection and tropical medicine (and general internal medicine), microbiologists with expertise in bacteriology and virology, infection control nurses (usually part of the microbiology team), pharmacists and public health physicians with expertise and responsibilities for control of infection in the community. The senior medical staff should be sufficient in number to enable an on-call service to be available at night and at weekends. A dedicated infectious diseases unit with trained specialist nursing staff and an on-site microbiology laboratory is also an ideal part of this service.

The delivery of care in a dedicated unit is predominantly to patients admitted to hospital from the community—from GPs—or from hospital transfer via accident and emergency departments or via tertiary referral from within the same hospital or from an adjacent hospital. Some specialist hospitals

Table 1 Structure of infection services in the UK—Model 1

Manpower:
Infection 'team' comprising:
- Clinicians—trained in infectious diseases—Tropical medicine and usually in general internal medicine with specialist nursing staff, specialist pharmacist, dietician, counsellors;
- Microbiologists—trained in Bacteriology—virology with infection control nurses and laboratory staff;
- Public health physicians.

Structure:
Dedicated infectious diseases facility for inpatient care and outpatient clinics;
Dedicated laboratory on site.

may have a disproportionate number of immunocompromised patients, depending on the nature of the hospital. Patients may be referred to an infectious diseases unit specifically on the basis of the triage system—a general medical patient referred to the hospital who happens to have infection—or by direct referral because of more specific problems such as meningitis, the febrile returning traveler, etc., or because the disease severity or complexity requires specific expertise for optimum care. On the infectious diseases unit, the infectious diseases physician takes full responsibility for the care of the patient, with input from specialists in other disciplines as required, and follow-up will take place after recovery at specialist infectious diseases outpatient clinics.

Although monospeciality training in infectious diseases is still available in the UK, almost all trainees opt quite appropriately for dual accreditation including general internal medicine.

The clinical infection service provides the facility for consultation at a bedside level, on complex diagnostic or management issues. Some infectious diseases units have, in conjunction with the microbiology service, established a formal consultation service within the hospital in an attempt to improve clinical care of patients and appropriate antibiotic use. Some of these formal consultation-based services have included unsolicited advice (by prior agreement with the relevant directorates) as well as solicited advice. Published reports attest to the clinical value of such a service as well as indicating the economic benefits in relation to the use of antimicrobial therapy [3,4]. Experience in the USA has also indicated an economic benefit of good antimicrobial prescribing [5].

The model 1 infection service also provides outpatient clinics, and this is an area where there has been considerable change over the last 15 years. Clinics are used in the historical way to follow up and monitor patients who have been in hospital, to establish serologic diagnosis, etc., but today the outpatient clinic is used to respond to the increasing demands on healthcare. Many departments have developed a 'rapid response' clinical service, whereby patients may be seen in outpatients as emergency/semi-emergency cases, which may avoid the necessity for hospital admission. Additionally, many infectious diseases units have developed specialist clinics, often supported by multidisciplinary teams, for patients with specific conditions such as HIV infection, hepatitis, and travel related illness, and to provide travel advice on health protection, and may provide a base for ambulatory/community delivery of intravenous antimicrobials.

The specialist advisory infection service does not always require clinically trained personnel, and it is the combined input from infectious disease-trained physicians and microbiologists which underpins the delivery of advice to medical and surgical services in hospitals and to primary care colleagues. There is no clear line of demarcation between the disciplines, and this is certainly successful when it works in a complementary fashion. The microbiologist will usually take the lead in the area of control of infection and lead the infection control nursing team.

The interaction with public health medicine is also an important part of the clinical infection service, and these personnel are immediately and actively involved in the community epidemiologic management associated with diseases such as meningitis and tuberculosis, as well as being responsible for matters of control of infection policy within the 'district'.

Model 1 is a multidisciplinary model with close interactive working between the different elements of healthcare professions involved in infection. Successful working depends on close collaboration and integration of the service, with regular meetings and with due recognition of the skills and expertise of all involved in the infection team. The multidisciplinary approach provides excellent opportunities for training in microbiology, infectious diseases and public health medicine.

This model provides training opportunities for undergraduate and postgraduate medical and nursing trainees in infectious diseases, HIV, travel services and other related disciplines such as public health. It also provides a structure for continuing medical education in order to maintain the clinical infection service to a community (GPs, etc.) at a level which is commensurate with modern advances.

Though not an essential part of the delivery of infection service, research in the field of infection is an important part of an active infection service.

Quality assurance of laboratory-based disciplines is well established in the UK, but quality assurance of the clinical input to control of infection and management of infection is less clearly defined, for obvious reasons. It is logical that serious infection, e.g. meningitis, multiresistant tuberculosis or HIV, may best be managed in a department with particular expertise in these infections. Certainly, in the case of HIV, the outcome is better if patients are managed by those experienced in the complex problems they present.

Model 2

The second model of care (Table 2) for delivery of clinical infection services in the UK, and by far the more common, is that which lacks any clinicians trained in infection as part of the clinical service and is based on microbiologists who have varying degrees of experience in clinical infectious diseases. As in model 1, most patients are diagnosed in the community and managed by the GP without involvement of the infection service. The main difference between the models is that the input to clinicians seeking advice in model 2 (both in hospital and in the community) is solely from the microbiologist, who may also be single-handed and may cover more than one hospital. The emphasis on advice therefore naturally tends to lean

Table 2 Structure of infection services in the UK—Model 2

Manpower:
Infection 'team' comprising:
• Microbiologist(s)—trained in Bacteriology—virology with infection control nurses and laboratory staff;
• Public health physicians.
Structure:
Specialist clinical advice from ID-trained physicians by phone of visits (occasional microbiologists also have some formal ID clinical training);
Dedicated laboratory usually on site.

ID, infectious diseases.

more towards the laboratory data and tests with use of antibiotics. Though experience indicates that discussion of some clinical cases may take place with an infectious diseases physician in a nearby center, this facility is inevitably limited if the physician is not on site. Many microbiologists have some clinical training, some having had broad infectious diseases training, but most do not. The many complex aspects of clinical diagnosis and management mean that they will not provide the clinical opinion of an infectious diseases physician and the service is therefore quite different and less comprehensive than the multidisciplinary approach provided in model 1.

Model 1 and model 2 both involve the public health physicians. The Acheson Report in 1988 [6] recognized the decline of infection control expertise in public health in the UK. Arising from this report there is now a network of public health physicians (consultants in communicable disease control—CCDC). Each District Health Authority throughout the UK has a CCDC who takes legal responsibility for control of infection in their community. However, the level of experience in infection control and the degree of interest in infection by the CCDCs in different health authorities, where the post is not always full-time, is very variable. Some CCDCs may come from a microbiological background but most have training in public health medicine. The relationship between the CCDC and the hospital-based infection services is essential for establishing a responsive and interactive service.

CONCLUSIONS

In summary, the delivery of infection services to the different communities in the UK differs according to local personnel. The key medical personnel for an optimal service are the infectious diseases physician, the microbiologist and the consultant in communicable disease control, and close collaboration between these is essential to ensure clinical and economic benefit. It is to be hoped that the outcome of the consultation document on acute general hospital services will facilitate an increase in infectious diseases physicians in DGHs to strengthen the delivery of infection services.

REFERENCES

1. Joint working party of British Medical Association, Royal College of Physicians of London, Royal College of Surgeons of England. *Provision of Acute General Hospital Services: consultation document.* 1998.
2. Emmerson AM, Enstone JE, Griffin M, Kelsey MC, Smyth ET. The second national prevalence survey of infection in hospitals—overview of the results. *J Hosp Infect* 1996; 32: 175–90.
3. Wilkins EG, Hickey MM, Khoo S *et al.* Northwick Park infection consultation service. Part 1/the aims and operation of the service and general distribution of infection identified by the service between September 1987 and July 1990. *J Infect* 1991; 23: 47–56.
4. Nathwani D, Davey P, France AJ, Phillips G, Orange G, Parratt D. Impact of an infection consultation service for bacteraemia on clinical management and use of resources. *Q J Med* 1996; 89: 789–97.
5. Molenski RJ, Andriole VT. Role of infectious disease specialists in containing costs of antibiotics in the hospital. *Rev Infect Dis* 1986; 102: 25–9.
6. Committee of Enquiry into the future development of the Public Health Function. *Public Health in England.* London: HM Stationery Office, 1988.